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Rooting Purple Sage Stem Cuttings

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ABSTRACT

Rooting of semihardwood cuttings of purple sage (Salvia dorrii) *with and without mist, bottom heat, root inducing substance (naphthalene-acetic acid/indolebutyric acid [NAA/IBA]), and fungicides (dichlone and captan) was evaluated. More than 75 percent of the NAA/IBA-dichlone treated cuttings rooted when placed in unheated rooting benches. Available rooting techniques for purple sage should make commercial propagation possible once quality cutting stock is developed.*

KEYWORDS: misting effects, bottom heat effects, root inducing substance x fungicide interactions, Great Basin shrub, *Salvia*

Purple sage (*Salvia dorrii* [Kell.] Abrams), an attractive drought-tolerant shrub species native to many of the Western States, is potentially useful for roadside revegetation and urban horticulture. The plant is evergreen, low (2.5-13 inches [1-5 dm], and spreading (10-38 inches [4-15 dm] diameter) in form, and sends up a profusion of purple flowers from May through June. Purple sage grows well on disturbed sites and is not eaten by most rodents, a constant threat to transplant survival.

Purple sage has been propagated from seed and stem cuttings; however, seed is not readily available and its germination requirements are uncertain. Up to 6 months are required to raise plants from seed to a sufficient size for transplanting. Semihardwood cuttings, on the other hand, root in approximately 2 months and potted cuttings can be transplanted as soon as root development is adequate. Purple sage has a potential for stem cutting propagation (Everett and others 1978) but improved rooting techniques are needed.

Weiland, Frolich, and Wallace (1971) found that heating the rooting medium increased rooting on cuttings of several Great Basin shrub species. They also found that cuttings of some xeric shrub species rotted under mist conditions. Charles (1962) had trouble with disease when he misted cuttings of desert willow (*Chilopsis linearis* [Cav.] Sweet) and *Vauguelinia californica* (Torr.) Sarg., two southern desert species. Therefore, we decided to examine the effects of mist and bottom heat on purple sage cuttings.

Snyder (1966) reported that interactions from combining root inducing substance (RIS) and fungicide treatments can produce exceptionally high rooting success in some species of plants. Fungicides found to be most effective in combination with RIS were: n-trichloromethylthio-4-cyclohexene, 1,2-dicarboximide (captan); 2,3-dichloro-1,4-napthoquinone (dichlone); tetramethylthiuram disulfide (thiram); and ferric dimethyldithiocarbamate (ferum).[2] Our own pilot studies with fungicides indicated captan and dichlone would improve rooting of purple sage cuttings.

METHODS

Purple sage cuttings were treated with six hormone-fungicide combinations. Two fungicide treatments-captan and dichlone--and no treatment were each tested separately in combination with one of two RIS treatments, a 50-50 (w/w) mix of naphthaleneacetic acid (NAA) and indolebutyric acid (IBA) and none. Fungicide-RIS treatments were tested under four rooting bench environments: misted with and without heat and hand watered with and without bottom heat.

Four large purple sage plants were collected on February 1, 1978, from a stand growing near Virginia City, Nev., and transported to the greenhouse under moist conditions. Semihardwood cuttings (leafy secondary growth) were taken from the terminal stems of the plants. Cuttings 0.13 to 0.51 inch (2 to 5 mm) in diameter and less than 5.1 inches (13 cm) in length were used.

Cuttings treated with RIS had their basal ends dipped in a concentrated solution (4,000 p/m) of combined NAA and IBA as described by Hartmann and Kester (1968). Fungicide-treated cuttings were either dipped in water or the RIS solution before being dusted with the selected fungicide (50 percent active ingredient). Treated cuttings were then placed in steam-pasteurized horticulture-grade perlite on the rooting bench.

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[2]The use of trade, firm, or corporation names in this publication is for the information and convenience of the reader. Such use does not constitute an official endorsement or approval by the U.S. Department of Agriculture of any product or service to the exclusion of others which may be suitable.

Half of the rooting bench was supplied moisture by an automatic evaporative demand misting system. The other half was hand watered daily to keep the rooting medium moist. Each half was divided into two sections and bottom heat supplied to one of the two sections by means of heating cables. Rooting bench temperatures were 64° to 73° F (18° to 23° C) for heated sections and 50° to 70° F (10° 21° C) for unheated sections. Air temperature in the greenhouse was maintained at 54° to 70° F (12° to 21° C).

The six RIS-fungicide treatments were replicated four times within each of the four sections of the rooting bench. Each replicate consisted of 12 cuttings. Replicates were located randomly within each section. Each plant provided cuttings for one replicate of the six RIS-fungicide treatments in each quarter of the bench. Therefore, the four plants were equally represented in all treatments and all quarters of the bench. Confounding of treatment effects by genetic differences in rooting ability among the four plants was thus eliminated in this design.

Cuttings were removed from the rooting bench after 10 weeks (February 3 to April 4, 1978). The number of cuttings with roots longer than 0.39 inch (1 cm) were recorded for each replicate.

To make the data more closely fit a normal distribution, numbers of cuttings rooted were transformed $\sqrt{x + 1}$, as suggested by Snedecor and Cochran (1957). Because the four misting-bottom heat combinations were not replicated and no statistical comparison was possible among them, the six RIS-fungicide treatments were analyzed in four separate analysis of variance tests. Hartley's sequential method of testing (Snedecor and Cochran 1957) was used to compare individual means when F values were significant.

RESULTS AND DISCUSSION

Greatest rooting (77 percent) occurred on misted, unheated cuttings treated with dichlone and RIS (table 1). The mean number of rooted cuttings ranged from 4 to 77 percent among the treatments.

Cuttings treated with RIS and dichlone or RIS alone, without bottom heat, rooted significantly more than all other treatments. When bottom heat was applied, in conjunction with either misting or hand watering, there were no significant differences among treatments. Apparently bottom heating increases rooting of cuttings not treated with RIS and reduces rooting in treated cuttings.

The effects of RIS and fungicide treatments, when combined, were not additive. Captan combined with RIS stimulated less rooting than would be expected from the separate effects of the chemicals. Dichlone and RIS interacted positively to improve rooting.

RIS treatment improved rooting in three of four rooting environments tested. There was no effect in the section with bottom heat that was hand watered. Misting was not necessary to get adequate rootings of treated cuttings. Misting appeared to enhance rooting if the rooting bench was heated, but was unnecessary if it was not. These inferences relative to rooting environment must, however, be viewed with some skepticism. Since rooting environments were not replicated, there is no way to test whether the results were due strictly to the treatments or some confounding factor, such as location.

Of the four factors examined in the study, only RIS treatment had a significantly positive effect on rooting. Fungicide application either had no real effect (dichlone) or a distinctly negative effect (captan) on rooting success. Purple sage cuttings may be rooted easily by treating with RIS and placing them in unheated rooting benches. Treating cuttings with the fungicide dichlone and supplying mist may improve rooting success.

Cuttings from one plant exhibited significantly greater rooting over all treatments (51 percent) than cuttings from the other three plants (15 to 22 percent). Apparently, certain individuals in the population from which the study plants were selected have a distinctly greater ability to root from cuttings. If such differences are genetic rather than environmental, increased rooting of purple sage cuttings may be obtained by selecting plants for cutting stock that have a greater inherent ability to root.

Table 1.--Mean percent of cuttings rooted by treatment

No bottom heat with mist		
RIS (NAA/IBA)[1]	Captan	[2]15^{b}
	Dichlone	77^{a}
	None	63^{a}
No RIS	Captan	4^{b}
	Dichlone	10^{b}
	None	6^{b}
No bottom heat, no mist		
RIS	Captan	27^{b}
	Dichlone	75^{a}
	None	67^{a}
No RIS	Captan	6^{b}
	Dichlone	8^{b}
	None	6^{b}
Bottom heat with mist		
RIS	Captan	[3]17
	Dichlone	50
	None	46
No RIS	Captan	6
	Dichlone	31
	None	33
Bottom heat, no mist		
RIS	Captan	[3]10
	Dichlone	17
	None	13
No RIS	Captan	10
	Dichlone	23
	None	13

[1]RIS: root inducing substance (a 50-50 mix [w/w]) of naphthaleneacetic acid (NAA) and indolebutyric acid (IBA).

[2]*a* means are separated from *b* means by Hartley's sequential method of testing, 5 percent level.

[3]No significant difference in rooting among the six treatments, 5 percent level.

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